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OCT 19 1921

16

PUBLIC WORKS

CITY **COUNTY** **STATE**

CONSTRUCTING A TWENTY-FOOT CONCRETE ROAD ON LONG ISLAND

The rate of construction of this road probably breaks the record, as is described in this issue. For a month the contractor averaged more than 300 cubic yards a day.

IN THIS ISSUE

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Unemployment Measures

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Rock Trenching for St. Paul Water Mains

Legal Decisions on Water Works Cases.

OCTOBER 15, 1921

Which Way ?

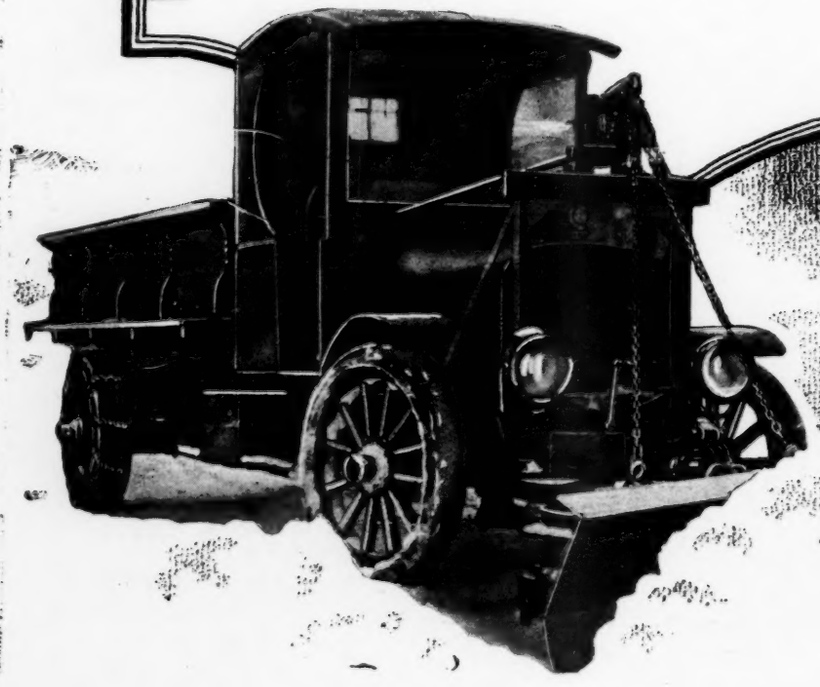
Pick and shovel cannot cope with tons of snow. Only efficient machinery can solve this problem.

WHEN the snows of winter fill the streets and highways, how do you plan to open them so that mail, express, produce and supplies may be properly handled and traffic may not be held up for days at a time?

In February, 1920, New York City was held in the paralyzing grip of a snow blockade for 12 days. The actual money loss to the city due to the interruption of traffic was Sixty Million Dollars. It took twelve days at a cost of five and one-half million dollars to partially clear the streets by the method shown above. In February, 1921, the streets were cleared in 12 hours at a very small cost by the method shown below. Which is the better way?

Without any obligation whatever, we will be glad to send you, on request, our new catalogue of the Champion Snow Plow. It will interest you.

THE GOOD ROADS MACHINERY COMPANY, INC.,
Kennett Square, Pa.



"Champion Snow Plow attached to a Netco Truck, used by the town of Weymouth, Mass."

PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"
Published Weekly by Public Works Journal Corporation

Publication Office, Floral Park, N. Y. Advertising and Editorial Offices at 243 W. 39th St., New York, N. Y.
Entered as Second-Class matter at the Post Office at Floral Park, N. Y., August 27, 1920, under the Act of March 3, 1879.

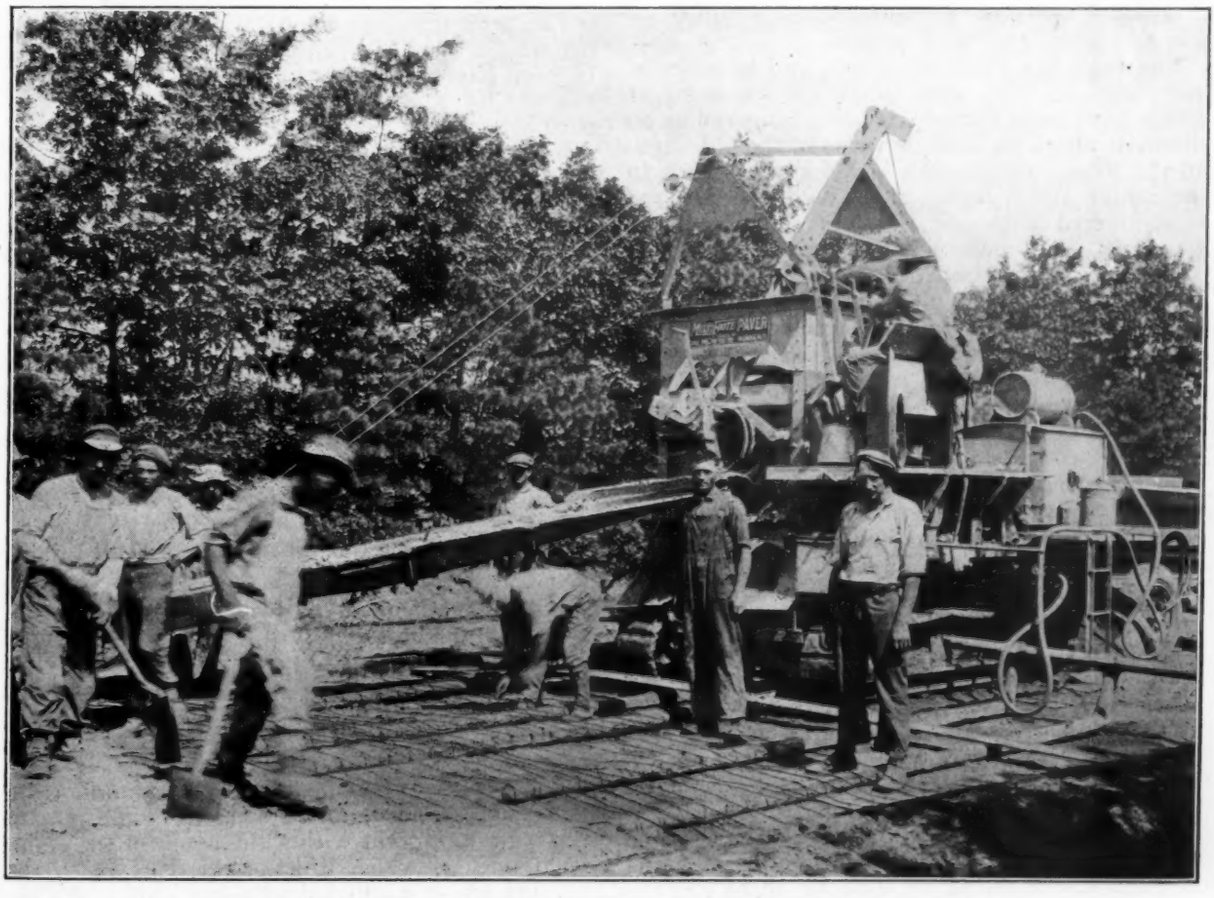
Vol. 51 OCTOBER 15, 1921 No. 16

Rapid Highway Work on Long Island

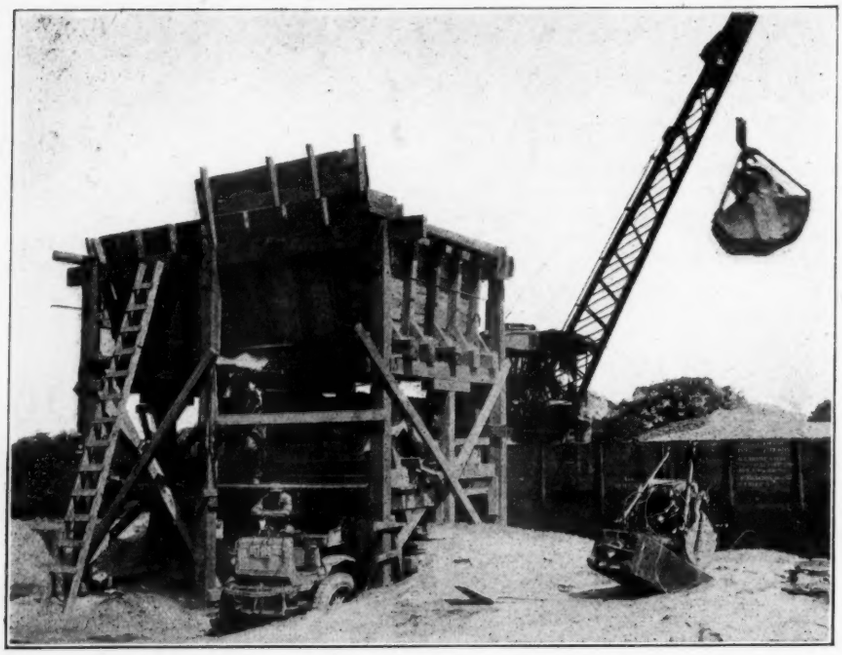
Thorough co-ordination of equipment, operations and supplies enables contractors to build a 20-foot highway 9 miles long at a maximum rate of nearly 1,000 linear feet per day.

New York State Highway 8039, from Center Moriches 9.07 miles to West Hampton, is being reconstructed with concrete surface to replace the old dirt road and some macadam on practically the same location, modified by reducing some of the grades and sharp curves.

The road passes through a rural district where the land is moderately rolling and the soil is chiefly sand, overlaid with some loam and drained by small streams. Its character is such that the concrete pavement 20 feet wide is laid directly on subgrade without the construction of any foundation course, and is drained chiefly by open earth ditches and concreted gutters alongside, and



LAYING CONCRETE, USING SPECIAL DEVICE FOR SETTING REINFORCEMENT



UNLOADING AGGREGATE FROM CARS BY STEAM SHOVEL

by concrete pipe culverts and ten concrete box culverts up to 5 x 5 feet in cross section. The limiting grade is 4 per cent, except for one short section where it has a maximum of 6 per cent. The maximum curve is 30 degrees, on which curves the roadway is extended to a width of 30 feet and banked about 7 inches.

The road has earth shoulders and is widened materially on both sides of all curves, some of which have been introduced with long radius to eliminate sharp right-angle turns in the old alignment. The concrete slab is 7¼ inches thick in the center and 6 inches thick on the edges and is reinforced with one thickness of wire mesh weighing 40 pounds per 100 square feet. The concrete is proportioned 1:1½:3½ of Portland cement, sharp, clean pit sand, and broken trap rock of 1½-inch maximum diameter.

On May 16, the contract was awarded to Wm. J. Porter & Co., of Eastport, Long Island, for $372,201 on a unit price basis. The actual construction was commenced July 7, and on September 1, after delays for rain and other causes, which left only 40 working days, the contractor had laid 27,249 linear feet of pavement and operations were being carried on with increased rapidity that, in August, indicated the completion of the job by October 10, 1921.

GRADING

The old road surface is broken up by plowing with 4-horse teams, the refuse material is removed and the surface brought to required subgrade by blade scrapers, drawn by teams. The cut averages only 6 or 8 inches and as the soil is chiefly dry sand, no foundation is required for the concrete. In some cases where grades are reduced by cutting off the tops of knolls, a softer substratum of loose sand is encountered which is generally puddled for two or three days in advance of the concreting so as to make it firm and solid to permit hauling the loaded trucks over it. When it is not solidified sufficiently for this, the subgrade is covered with plank mats about 6 feet long and 8 feet wide, that are laid down to form a temporary roadway and shifted from place to place and used as required. The grading is done by a force of about 20 men and 7 teams.

FORM WORK

Subgrade is carefully leveled and smoothed and Blaw-Knox forms are set up at least 300 feet in advance of the mixer, a total of about 2,500 linear feet being supplied for the job. They are set uniformly 20 feet apart on curves as well as on tangents to permit the work to be carried on uninterruptedly, after which the widening at curves is effected by the construction of separate strips built alongside as an independent operation and thus saving considerable delay and adjustment.

SUPPLY AND STORAGE OF MATERIALS

The broken stone, of which about 10 carloads per day is used, is shipped by water from the Hudson River Palisades to Blissville docks, Long Island City, and thence by rail 71 miles to Eastport, where it is delivered at a price of $3.85 per cubic yard, which is less than the estimated cost of opening a local gravel pit and excavating, washing, screening and delivering the gravel.

Sand is excavated by the contractor in a pit adjacent to the standard-gage siding 850 feet long, which he installed for the delivery of stone, cement and other freight from the Long Island Railroad. The pit was opened by stripping from 1 to 4 feet of loam from the irregular surface of the ground by means of an Erie shovel with a 32-foot boom and a ¾-yard clam-shell bucket. Afterwards the shovel was mounted on a wooden platform about 10 feet above the original surface of the ground, and dry sand was excavated and delivered directly to the loading bin. From 350 to 400 yards of stone and sand are handled daily with this rig.

At the present time the excavation has enlarged the pit to a depth of about 20 feet, length of 400 feet and width of 200 feet, thus carrying the sides beyond the reach of the comparatively short boom in use. As it was not considered necessary to install a longer boom or to operate a dragline bucket, a Fresno scraper has been provided that is hauled by a three-mule team and brings the fine, loose sand from the foot of the bank to a point within the reach of the clam-shell bucket, which lifts it and delivers to the loading bin at a convenient boom radius, the entire operation costing $.60 per cubic yard for sand.

STORING, LOADING AND TRANSPORTING AGGREGATE AND CEMENT

The arrangement with the railroad company allows the consignee 48 hours for unloading the cars and charges demurrage on every day that the cars are held for more than 48 hours. If the cars are unloaded in less than 24 hours an allowance is made for every car-day of time thus saved, and is applied as a credit on demurrage charges up to 6 days. So far the cars have been unloaded so promptly that all demurrage charges have thus been automatically cancelled and the contractor is able to use the cars for limited storage. They are, therefore, unloaded only about as their contents are used, by means of the clam-shell bucket operated by the steam shovel and delivering to the elevated storage bin of about 40 yards capacity, one-third of which is partitioned off for sand delivered by the same bucket from the adjacent pit.

When the stone cannot be delivered rapidly enough into the loading bin, the balance is deposited in a storage pile alongside the steam shovel, whence it is reclaimed by the clam-shell bucket whenever there is a shortage of cars. It was intended to establish and maintain a storage pile of perhaps 5,000 yards capacity, but so far* the stone has been used nearly as fast as received so that the storage pile does not average more than 300 or 400 yards. The sand, which is excavated at intervals between the use of the steam shovel for unloading stone cars, is only handled fast enough to keep the loading bin filled.

MEASURING AND LOADING AGGREGATE

The hopper bottom of the bin discharges through horizontal steel gates into a measuring car with an A-shape dump bottom and compartments holding the exact amount of sand and stone required for two batches of concrete. The car is mounted on an elevated track under the hopper and is first charged with the required amount of sand for two batches of concrete and is then pushed a few feet by hand to position under the stone bin when the other compartments are filled with stone. There is headway under this measuring car for a 2ton automobile truck to back into position under it. The car body is divided into two equal portions by a vertical center transverse partition hinged on the upper edge and locked in position by a latch. When the truck is properly spotted the attendant above fills the measuring box, operates the levers and dumps all four compartments of the box into the truck so that each compartment of the truck receives one batch of sand and one of stone.

The whole operation of filling and dumping the measuring box takes only about 15 seconds, after which the truck is driven a maximum distance of 300 or 400 feet to a position alongside a carload of cement where four men quickly empty five bags of cement on top of the stone in each compartment and the truck proceeds directly to the concrete mixer. Any surplus of cement not used as fast as unloaded is stored in a shed with a capacity of about 2,000 bags.

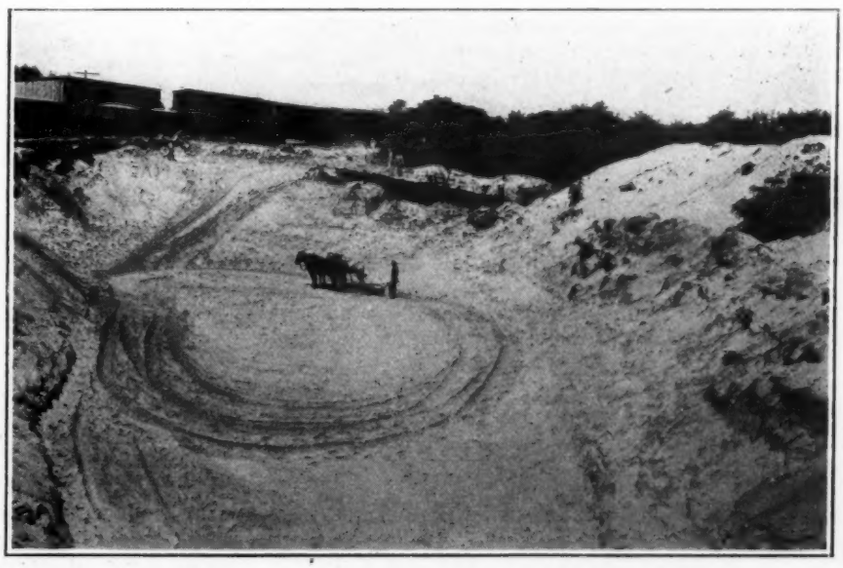
The cement is purchased for $2.70 per barrel, delivered, and is used at the rate of from 2,000 to 2,500 bags per day. The bags are emptied as completely as possible into the trucks, after which they are taken to the storehouse, shaken, baled and returned to the mills. Considerable thought has been expended on the consideration of a method of receiving, storing and unloading bulk cement, but the work has progressed so rapidly and so favorably under present conditions that on this job it has not been thought expedient to install a cement unloading equipment at the present time when the work is so far advanced.

CONCRETING

Concreting was commenced at a point about 2 miles east of the central storage plant at Eastport and proceeded westwardly to Eastport.

After this portion had been completed the mixer was moved to a point 1¾ miles west of Eastport and operated eastward to meet the section where work was completed. Afterwards the mixer was transferred to the original starting point, 2 miles east of Eastport, and is now continuing from there to the eastern extremity of the contract and thence will be transferred to the second starting point and complete the work from that point to the western extremity, thus providing for all the long hauls over the new concrete for a considerable distance.

The aggregate and cement are hauled by eleven 2-ton Autocar trucks, each of which made an average of fifteen round trips daily at the maximum haul of about 4½ miles. The trucks traveling over the original and new road and over the



EXCAVATING SAND FOR CONCRETE BY FRESNO SCRAPER

*This article was written about Sept. 10th.

subgrade up to the machine, turn around and back to position and dump the first batch of dry material into the loading machine skip, and move forward to clear it while it hoists and delivers to the mixer drum. The empty skip is lowered and the truck backs up again and dumps its second batch into it and moves away after a total stop of about 1 minute 30 seconds for unloading.

The 25-foot dry batches of concrete are mixed for at least one minute in a 21E "Multi-Foote" paving mixer that is mounted on a caterpillar traction and discharges through a 16-foot pivoted chute slowly swung back and forth across the whole width of the roadway as the machine advances, thus distributing the concrete in a zig-zag line, almost exactly in the position required, so that it needs very little spreading.

The mixer is operated by a gasoline motor, 4-cylinder, slow speed tractor type.

SETTING REINFORCEMENT

The rapidity and excellence of the work is notably facilitated by the ingenious method that has been adopted for exactly laying and maintaining the reinforcements in position without the use of fillers, chairs, blocks or suspension devices, liable to displacements and uncertainties. A transverse bar about 18 feet long was attached to the mixing machine and to it are hooked the curved upper ends of five 3-inch pipes spaced equidistantly and bent to right angles about 2 feet below the hooks so that they may hang vertically from the bar and allow the ends, about 10 feet long beyond the bends, to rest horizontally on the subgrade.

The reinforcement mesh in strips 6 feet wide and 19 feet 10 inches long is delivered in advance and stored in piles alongside the road until it is used, when the pieces are successively laid in advance of the concrete on top of the five 3-inch pipes supported on subgrade as above noted. The concrete is then poured between the forms and passing readily through the wide meshes of the reinforcement fills all of the space below and above the latter.

As fast as the machine advances it pulls the horizontal pipes out from under the reinforcement and the latter is held exactly in position by the 3 inches of concrete below it, while the pipes remaining seated on subgrade, continue to support the reinforcement as it is placed in advance of the concrete and thus automatically insure its proper relative position.

As the pipes are dragged forward almost as soon as the concrete is placed over them, the latter is still plastic and immediately fills the spaces left by the pipes and is thoroughly compacted by the subsequent action of the finishing machine. This device (for which patent application has been made) costs practically nothing to install and operate, requires no time or attention for moving and adjustment, is automatic in operation and is considered very efficient and satisfactory.

FINISHING

Concreting proceeds almost continuously during the entire working day, and the concrete, after being spread by four shovelers, is finished by a machine that goes over the surface twice, the first time operating rapidly without applying the reciprocating belt in the rear, and the second time operating more slowly and using the belt.

Following the finishing machine are two bridges, each mounted on two 2-wheel trucks that engage the side forms and support the men that finish the joints and score the finished surface of the concrete with transverse strokes of a wooden broom, roughing the surface for improved traction.

The joints, alternating 30 and 36 feet apart, conform to the widths of the reinforcement strips and are made with "Elastite," which is set to project one-half inch above the top surface and after the concrete has thoroughly hardened is trimmed off flush with a sharp-edge shovel.

The concrete gang includes 10 men at the mixer, 1 man operating the finishing machine, 2 men setting forms, 2 finishers, and 1 man sweeping and making joints. The joints are closed with a split wooden float 30 inches long with a 20-foot handle. Afterwards they are gone over by a man with a trowel working on the rear bridge.

PROGRESS

The average progress was unusually rapid as soon as the work was fairly under way, as is shown by the July records, which have been consistently increased since and are expected to be still greater as the length of haul and the hauling over old road decreases.

July 16th	705 feet	
July 18th	570 "	
July 19th	620 "	
July 20th	790 "	
July 21st	661 "	
July 22d	785 "	
July 23d	735 "	
July 25th	802 "	
July 26th	807 "	
July 27th	730 "	
July 28th	630 "	
July 29th	606 "	(rain 2 hours)
July 30th	780 "	
Aug. 1st	836 feet	
Aug. 2d	Rain all day	
Aug. 3d	" " "	
Aug. 4th	715 feet	
Aug. 5th	801 "	
Aug. 6th	847 "	
Aug. 8th	810 "	
Aug. 9th	733 "	
Aug. 10th	708 "	
Aug. 11th	502 "	
Aug. 12th	708 "	
Aug. 13th	950 "	

The concrete paving was completed October 8, almost exactly three months after the mixer was first started, at 2 p. m., July 7. The elapsed time from the beginning to the completion of the work included 82 week days, from which there should be subtracted 7 days, the aggregate time during which the concrete mixer was not working, giving the net period of 75 working days during which the entire amount of 47,890 linear feet, equivalent to 106,422 square yards of concrete was laid. This was an average speed of 274.6 cubic yards or about 1,428 square yards daily, although much of the work was done when the materials were

hauled several miles by trucks from storage to mixer, sometimes occasioning delays in charging the machine.

The log of the elapsed time gives in detail the number of hours when the mixer was waiting for cement; when it was waiting to replace a broken casting; while it was out of commission during long movements to other parts of the route location; when it was delayed by trouble with the water supply; when work ceased on account of rain; and on certain occasions when the progress was slower on account of the very heavy sand that the trucks had to drive over on the subbase. On different occasions the mixing machine was moved 6 miles, 6½ miles, and 7 miles, while the aggregate and cement had to be hauled sometimes as much as 6½ miles. Not withstanding all of the delays 11,904 linear feet of pavement were laid between July 7and July 31, 15,378 feet in August, 15,805 feet in September and the remaining 4,803 were laid in the first seven days of October.

The equipment and operations are strictly up-to-date. The best progress so far has been 950 linear feet in one 9-hour day, which was accomplished when the materials were hauled about 2 miles. The volume of concrete placed equals 500 cubic yards for 1,100 linear feet of roadway. From every day's operation two 6-inch test cubes are made and sent to the engineers' laboratory to be broken.

As concreting is not permitted during stormy or even showery weather, it has not been considered necessary to provide covers for the dry batch aggregate and cement in transit from storage to mixer. Each morning the concrete laid on the previous day is covered with two or three inches of sand, which is kept uniformly wet with a hose for 10 days and then removed and traffic permitted. Water for this purpose and for the concrete is provided by a 6 x 10-inch Worthington steam pump and a 6 x 4 x 6-inch reserve pump delivering under direct pressure through a maximum length of about 5,000 feet a 2-inch pipe. Water is derived from convenient streams and ponds to which the pipes are shifted as the work advances.

PRINCIPAL QUANTITIES

The estimated quantities involved include about 20,600 cubic yards of pavement concrete, 200 yards of culvert concrete, 30,000 barrels of Portland cement at $3.15 per barrel, and 25,000 yards of earth excavation at $1.15.

The equipment includes, besides the plant already mentioned, a blacksmith and repair shop and a garage with two expert repair men at headquarters, where there is established a gasoline service station with an 800-gallon underground storage tank that is filled daily by the Standard Oil Co.'s service wagons and is equipped with the regular Standard Oil Co.'s metering pump. The trucks and the general service automobiles consume an average of about 350 gallons of gasoline daily. Spare parts are kept for ordinary repairs of the automobile trucks.

The work is executed by a total force of about 53 men paid from 40 cents per hour upward, with a total weekly payroll of about $2,700. No difficulty is at present experienced in securing plenty of labor, most of which is Spanish. The men come principally from New York City and live in houses furnished them, rent free, by the contractor. They provide their own cook and commissary and are contented and efficient. The work is under the charge of J. H. Sturdevant, division engineer, New York State Department of Highways, and H. T. Tuthill, resident engineer. It is in direct charge of Wm. J. Porter, his principal assistant being W. J. Anderson.

Rock Trenching for St. Paul Water Mains

Power equipment saves more than $100 per day over cost of hand work.

In many parts of St. Paul, rock lies close to the surface of the ground and it is necessary to excavate the trenches for pipes and mains for the city water distribution through solid limestone and sandstone, work that is often done in winter.

This work was formerly done by hand, but is now largely done with power equipment, which, according to J. W. Kelsey, superintendent of St. Paul water department, effects an important saving of time and money. Where blasting is required, the drilling is done with a jackhammer,

OPERATING JACKHAMMER DRILL FROM PORTABLE GASOLINE DRIVEN AIR COMPRESSOR

operated with air from a portable compressor and gasoline engine mounted on wheels, which is easily transferred from place to place as required and possesses superior advantages over a heavy steam engine and boiler, or an electric motor which is often unavailable on account of the impossibility of plugging in on current.

The compressor and jackhammer drill operated by two men replace 18 men required to do the same work by hand at an average wage of $4.50 per day, thus effecting a labor saving of $72 daily. The compressor used has a capacity of 80 cubic feet of air per minute at 100 pounds pressure, which is ample for operating a standard rock drill that it is claimed will penetrate limerock at a rate of about 1 foot per minute.

The trenches are backfilled with a dragline scraper, operated by a double-drum 15 h. p. engine and a 30-foot boom. Only one man is required to operate the backfiller machine, which is mounted on caterpillar treads and replaces 3 teams and 6 men. The machine has a capacity of 640 cubic feet per hour and is capable of backfilling a trench 8 feet deep and 3 feet wide at the rate of 110 feet per hour. The total cost of operation is $40.86 per day, amounting to 0.7 cents per cubic foot of material backfilled and effecting a saving of about $30 a day over the team and hand work.

A cost analysis shows that the expense of operating the air compressor 175 days in the year was as follows: For depreciation, $582.50; for interest, $87.37; for maintenance and repairs, $50; for gasoline and lubricating oil, $380.78; for labor, $1,575; making a total of $2,675.65, or $15.29 per day.

Both the air compressor and the backfiller are operated by Novo engines, of which the water department owns five. One 15 h. p. engine is operating an air compressor; another 15 h. p. engine is operating a trench backfiller; and a third 15 h. p. engine is operating a concrete mixer. The other two are 2 h. p. Novos on pump rigs, used to pump water from trenches when laying water mains and it was on the basis of their good performance that the larger outfits were purchased which have been in use from one to two years.

Concrete Pipe in Alkali Soils

Investigations made in Minnesota indicate that concrete pipe is liable to decomposition when water in the surrounding soil contains more than 3,500 parts per million of alkali salts. Quality of concrete pipe used for Minnesota drains should be improved.

The effect of alkali on concrete drain tile and the general conditions of alkalinity in southwestern Minnesota were discussed at some length before the Minnesota Surveyors' and Engineers' Society by Dalton G. Miller, senior drainage engineer of the United States Bureau of Public Roads, and in connection with the publication of this paper in the Bulletin of the Minnesota Federation of Architectural and Engineering Societies, a further brief statement was made by E. V. Willard, drainage commissioner of Minnesota. While the facts and figures cited by Mr. Miller referred to Minnesota, the conclusions which he drew probably apply generally to all sections where there is considerable alkalinity in the soil. Below we have placed in condensed form the more salient points of these two papers.

Mr. Willard states that "today farmers and land owners of Minnesota are spending millions of dollars every year on drain tile. Much of the popularity and impetus given the tile drainage movement is due to the entering of the cement or concrete tile into the field, and there can be no doubt but that without the concrete tile underground drainage could not have made the substantial progress that has been the result." If properly made and used, concrete tile is effective in securing the economical and permanent drainage of wet lands. Conditions in certain parts of Minnesota however "appear to bar cement tile from consideration." Investigations "seemed to have proven beyond a doubt that where alkali salts in solution in the ground waters occur in sufficiently great concentration, the concrete tile cannot be expected to withstand the action of the alkalis." The Agricultural Experiment Station of the Minnesota State University, the State Department of Drainage and Waters and the United States Department of Agriculture are jointly investigating to learn all they can of the subject with a view to advising what areas are unsafe for the use of cement tile and possibly to learn how to use such tile with safety.

Mr. Miller's paper took as its basis the results of examinations of soil and water in various parts of Minnesota and Iowa and of pipe which had disintegrated, apparently because of soil alkalinity.

The alkali salts predominating in southwestern Minnesota are almost wholly sulphate of magnesium, sulphate of lime and sulphate of sodium. The acid radical of each of these salts is sulphuric acid, which, under certain conditions, is free to react with the lime and alumina of Portland cement. Samples of partially disintegrated tile from southwestern Minnesota examined chemically and microscopically in the laboratories of the Bureau of Public Roads at Washington have been found to have lost 53 per cent of the cement from the outer portion of the tile and about 30 per cent from the interior portion. One of the chief physical changes resulting from the action of sulphate waters in concrete is a cracking and checking of the surfaces exposed to this action, and a swelling of the mass, approximating 100 per cent increase of volume in some cases.

Where tile were found to have failed, samples

were taken of the soil, of the water flowing in the drain, of the soil water, and of water taken in open ditches in the drainage system. These data were tabulated and analysed by Mr. Miller. From this analysis, averaging the data obtained, it was found that alkali salts in the soil water alongside the pipe were about 4½ times those in the water flowing in the drains. There were considerable departures from this average and there was found to be a wide variation in salt content of the soil water within very narrow limits. For instance, at one point soil water three feet below the surface contained 3.49 per cent alkali, while at eight feet this had fallen to 0.5 per cent. "This wide range in conditions of alkalinity within very short distances accounts, in part at least, for the fact that not infrequently single tile have disintegrated while adjoining tile apparently have not been affected."

SALT CONTENT NECESSARY TO PRODUCE FAILURE

He concludes that "it does not seem unfair to conclude from these data that, with the salt content of a drain water known, it would be consistent to expect to find soil water somewhere along the tile system that would contain 4½ times as much of the alkali salts. On this assumption, along a drain the water of which contains 1,000 p. p. m. of soluble salts, there might be found places where the soil water contained 4,500 p. p. m."

Sufficient data were not available to determine just what alkali salt content of drainage water was necessary to destroy the cement pipe, but those available "seem to indicate that failure results within a comparatively short period of time when the concentration exceeds about 5,000 p. p. m. and very pronounced failures have resulted in at least three systems in which the soil water ran considerably below this figure."

It was evident that "a close relation exists between the failure of the tile and the total salt content of the soil water in contact with the tile. Of course, other factors, such as thickness of the tile walls, difference in loading due to different depths of cuts, and difference in the quality of the concrete used in the manufacture of the tile, enter into this problem; but in general the results have been quite consistent in that no failures have been found where the alkali was inconsiderable in quantity, while the most pronounced failures have been where the salt content has been abnormally high. Also, it is well to note, the failures observed have occurred after exposure for only four years which, to say the least, leaves open to question what the result will be of the action of the waters less rich in the sulphates after a period of 6, 8, 10 or a longer period of years."

However, concrete tile in Iowa have satisfactorily stood up under field conditions for a number of years, although the alkali salt in the drainage water was found as high as 970 p. p. m., while in nearly all cases the content of the drain waters ran between 400 and 500. This would seem to indicate that where the ground water did not contain more than 2,250 p. p. m. of these salts there was little danger of decomposition of the pipe, and the pipe might be safe up to a ground water content of about 4,500. Mr. Miller, on the basis of the Iowa experience, believes it fair to assume that the danger limit for soil water lies somewhere between 2,500 and 4,500 p. p. m. Averaging these at 3,500 and dividing by the factor 4½ would indicate a drain water with 800 p. p. m. as being the limit of safety. As a matter of fact, there has been found to date but one failure where the salt content of the drain water ran as low as this and the average of the drain waters in decomposed tile investigated was 2,000 p. p. m., more than half of them lying between 1,500 and 2,500.

All this is rather indefinite, but Mr. Miller believes it safe to infer that if a drain water carries sulphates of the nature found in the southwestern part of Minnesota to the extent of 1,500 p. p. m. or more, disintegration will result somewhere along a system of concrete tile of ordinary commercial quality as represented by the Minnesota product.

PRECAUTIONS BY DESIGNING ENGINEERS

Since no method is known for rendering Portland cement wholly resistant to the action of sulphate waters, it is recommended that pipe made of cement be not used in those areas where the ground waters run consistently high in alkali sulphates. Where such dangerous conditions exist is a matter for the engineer to decide, but Mr. Miller suggests making borings at intervals of 500 feet along the main line and principal branches of the proposed drainage system and collecting there samples of soil water and determining their salt content.

The method used by the writer for collecting water samples has been to make the borings with a two-inch soil auger with an extension handle. After making a boring the water is collected in a galvanized-iron cylinder about 1½ inches outside diameter and 18 inches long. This cylinder is fitted with a small flap valve at the lower end while the upper end is threaded so it may be screwed into the auger rod. The valve should be so arranged as will permit of ready removal for cleaning. These are details, however, that any engineer can readily work out.

After the water samples are secured, comes the question as how best to make the salt determinations. For practical purposes the writer feels justified in recommending a type of wheatstone bridge which has been developed by the United States Bureau of Soils and is manufactured by the Central Scientific Company of Chicago. A bridge of this type has been used on all the work in southwestern Minnesota and checked against a great many chemical analyses. Generally, where the salt content runs between 200 and 5,000 p. p. m., the results as determined by this bridge have been within 15 per cent of the true results as determined by analysis.

The principles involved in the use of the bridge are comparatively simple and are based on the fact that the conductivity of a solution increases with the salt content. In other words, high resistance means a low salt content. Also the conductivity of a solution increases with a rise in temperature. A solution, then, is taken and the resistance measured on the bridge by checking against soils of known resistance and this resistance and the temperature recorded. By reduction tables the resistance is corrected to correspond to a temperature of 60 degrees, and then reading directly from a curve already developed for any particular area the salt content can be at once determined. In case the salt content is in excess of about 5,000 p. p. m., the solution must be diluted with distilled water until it comes below this limit. Then the content of the original solution can be

computed. This sounds somewhat complicated, but as a matter of fact the bridge is not difficult of operation and to obtain consistent results requires only practice. As a check against the results it will be well to have determinations for total salts made by a chemist for about 10 per cent of the water samples.

If these recommendations are followed a definite idea can be had as to the alkalinity of any area previous to the installation of the drainage system, the reliability of the results being almost wholly dependent upon the engineer in charge of the work.

In making the borings and collecting the water samples, more than ordinary attention must be given to the deeper cuts, as it has been found that water samples taken from borings in small ridges between depressions, and in the rims surrounding depressions, quite often run much higher in alkali than do those samples taken in the depressions.

BETTER PIPE NEEDED

It is recommended that manufacturers of concrete pipe endeavor to improve the quality of the pipe so as to resist as far as possible the action of these alkali salts. "Unless there is a constant and concerted effort made to improve the product of the plants serving the southwestern part of the state, concrete drain tile will achieve a reputation that will react against all parties interested in their installation." The author does not make any definite recommendations as to how these improvements can be brought about but suggests that (1) only properly graded sand, clean and free from vegetable matter be used; (2) more coarse aggregate to be used; (3) the mix be made slightly wetter; (4) more attention be given to securing the densest concrete near the outer surface of the tile; and (5) the product in all cases be thoroughly cured before installation. He believes that "too much stress cannot be placed on grading and mixing the sand in the proper proportion."

Removing Fine Material from Sand

In casting about for sand to be used in constructing the roadway pavement for federal aid project No. 41 in California, none could be found near the south end of the project that would meet the requirement that it contain not more than 5 per cent of material which would pass a 100-mesh sieve, all the local sand being found to contain at least 15 per cent to 20 per cent of this fine material. To import sand that would meet the specifications would add considerably to the expense. Could the fine material be removed from this sand, it would be acceptable.

In this section the humidity is low and the summer temperature sometimes reaches 120 degrees in the shade, so that the sand as excavated contains practically no moisture. The engineers therefore tried a plan, which was found to be successful, whereby the fine material could be blown out of the sand. The ordinary revolving screen for removing material exceeding ¼ inch in size was used and the fine material, as it dropped from the screen to the bin passed in front of a nozzle which directed against it a current of air from a centrifugal fan. Means were provided for regulating the velocity of the air so as to remove from the falling sand particles finer than any desired limit, the coarser particles falling into the bin beneath. If the sand had been damp this probably could not have been worked successfully, but under the circumstances it has been proved to be practicable and inexpensive. The blower is operated by a belt from the gas engine that operates both the revolving screen and the conveyor which carries the sand to it.

Where the sand is not sufficiently dry to be treated in this way and abundant water is available, the finer material has been removed by washing, the fineness of the material removed being regulated by the upward velocity of the washed water.

"The Highwayman"

The state highway department of New Jersey has begun the publication of a monthly medium for reaching the public, a four-page bulletin being issued once a month which is sent free to any citizen of New Jersey upon application. So far two numbers have appeared, one for August and one for September.

The first two issues have certainly indicated a desire on the part of the department to reach the ordinary citizen and not aim their remarks solely or even chiefly at those who are concerned in road construction as an engineering or contracting proposition. This does not mean that there is no real information given, however. On the first page of the second issue a description is given of the work done by the motor vehicle department in checking up the weights of vehicles at the rate of about 250 a week, stating that 25 per cent of these are found overloaded, some of them as much as 10 tons, with the load resting on the axle and the tires flattened out so that the entire load is transmitted unsprung to the road. Another article by R. B. Gage, chemical engineer of the department, describes the use of the "Calyx" drill for taking 6-inch cores from completed concrete pavements so as to determine exactly how the pavement was actually constructed; one set of such cores showing a variation of nearly four inches in the thickness of the concrete in one contract.

The lighter reading refers in a popular and sometimes humorous vein to matters connected with roads and their use. For instance: "If you insist on speed you'll get it—sooner or later in the neck." "Statistics show more accidents on good straight roads than at bad curves. A word to the wise is sufficient—once in a great while." Another one reports J. A. Williams, division engineer, as saying: "Heard of one inspector who claimed the specifications had been changed on him—inquired if they were going to use trap rock or crushed stone."

The leading editorial starts out in a somewhat startling manner as follows:

Say you, Gentle (?*) Reader!

When I pulled a gun on you last month and held you up, I said I was going to introduce you to the State Highway Department.

Now, if you're a road user (and who isn't that is anybody?) I know you've cussed "the lumpy lanes of No. I." until your breath gave out and your collar button very nearly punctured your Adam's apple.

*Like H--l

But it is one thing to cuss, and another to *construct*. What d'you ever *do* to help your little old State have a foot of better road?

That is none of *your* business, you say.

But hold on a minute; it is your business—because you're spending money for it. That being so, you ought to have at least a reading acquaintance with the men who are laying out these funds for you. I am introducing you to some of them, and to their work, this month, and you will hear more of them in future issues of the *Highwayman*.

It is surely so, that the more *you* know about roads, the better roads your State will have. Just send your name into the Highway Department at Trenton, N. J., and I'll hunt you up once every month and introduce you to some new member of the Highway Band; and also keep you posted on detours all over the State.

Together with the "Highwayman" is sent each month a leaflet entitled "Road Tips," which gives the monthly bulletin of the detours. The information at the head of this bulletin should be appreciated by New Jersey motorists—"All detours are posted with signs and blazed with arrows."

Some Water Works Details

Supporting cast iron pipe on saddles. Joints of lead substitutes. Materials for service lines.

An interesting paper aptly described by the title, "Some Problems Encountered in Water Works Engineering," was read before the Engineers' Society of Western Pennsylvania by W. C. Hawley, chief engineer and general superintendent of the Pennsylvania Water Co., and was published in the proceedings of that society. Some of the experiences and suggestions of the author that seem to be especially interesting are as follows:

Breaks occurring in a 42-inch pipe under normal pressure were found to have been caused by the fact that the pipe was resting upon stone or rock, and similar experiences were had with a 30-inch line also. The author therefore advises against the "provision not infrequently seen in specifications for large pipe lines, especially in soft ground, to the effect that the pipe shall be laid on one or two wooden blocks or saddles per length. Concentrating the load on one point is dangerous, and while the blocking may be made to fit the pipe so that the concentration would be less than in the case of a pipe bearing upon a rock, still it is wrong in principle. It is better to give the pipe a uniform bearing and it can be done by proper care in bottoming the ditch and backfilling.

"Cast iron pipe, especially the small sizes, should be thoroughly bedded when laid. This is a matter which sometimes is not given the attention it deserves. Many of the breaks which occur in newly laid pipe of adequate thickness doubtless occur from uneven settlement due to improper bedding of the pipe when laid. After the pipe has been laid long enough to become thoroughly bedded, a considerably higher pressure may be put upon it than would be considered safe for the weight of the pipe used."

Concerning the matter of joints, the author says: "One of the important innovations in the laying of cast iron pipe within recent years has been the use of sulphur compounds instead of lead for making joints. Lead requires calking while the sulphur compounds do not, and thus they obviate the employment of a class of labor which is always troublesome and whose work requires watching and inspection. The sulphur compounds are harder and do not squeeze out of a joint as does lead. They not only save the cost of calking, but the first cost of the material is less than lead and there is the additional saving in the digging of the large bell holes required to calk a lead joint, and the maintenance of bell holes and ditch while the joint is being calked. At present prices the saving is from 50 to 75 per cent of the cost of lead joints."

Discussing the matter of the best material for service lines, the author believes that no one material is satisfactory everywhere. "In some places soil conditions make it impossible to use iron or steel pipes, either galvanized or black, and in others they fill all requirements. Some water will rust iron pipes, and thus necessitates the use of lead, tin-lined pipes or cement-lined pipes, which are used to a considerable extent in New England. A soft water or a water containing considerable carbonic acid gas cannot safely be conveyed through a lead pipe as it is liable to dissolve lead from the pipe and cause lead poisoning. In such cases a tin-lined or cement-lined pipe should be used. A serious trouble with lead pipes has been the plumbers' wiped joints. The failure of these joints under ground is a constant source of leakage and waste. There are now on the market patent couplings so that the use of the wiped joint is no longer necessary. These couplings seem to be coming into favor rapidly."

Increasing New York's Transportation Efficiency

Owing to the failure to make many needed improvements since the close of the war and to the refusal of the New York City authorities to extend, improve or even to properly maintain existing transportation lines, the congestion of the passenger traffic in New York City has become worse and worse until it is almost unendurable and at the best, substantial relief cannot be afforded by the badly needed new construction until after a delay of years.

It is therefore most encouraging to receive the announcement published last week, that the Rapid Transit Commission, after receiving the report of its engineer, Robert Ridgway, will undertake improvements and readjustments of the existing plant that it is estimated will provide for its carrying 500,000,000 more passengers annually than at present, thus effecting an increase of about 20 per cent in its efficiency without the delay or expense of new construction, which should, however, be pushed as rapidly as possible to provide greater comfort and convenience for the passengers, to catch up as much as possible with the

increasing demands, and to avoid as much as possible the future predicaments of the same character as now exists.

It is stated that within the last three years traffic controlled by the Transit Company has increased 25 per cent while the facilities have increased only 5 per cent. The new plan contemplates the operation and co-ordination of all the existing lines, including some that have been temporarily discontinued, adding some new cars, and pooling the income from different branches so that the prosperous ones can carry those that are unprofitable. Mr. Ridgway has just returned from an inspection of the rapid transit systems in European metropolis and reports that many improvements possessed by them can be advantageously adopted for New York.

North Carolina Section of the A. W. W. A.

Last month there was formed a North Carolina Section of the American Water Works Association. At a meeting at Greensboro, N. C., J. L. Ludlow, consulting engineer of Winston-Salem, was elected president; Thorndike Saville, associate professor of hydraulic and sanitary engineering at the University of North Carolina, was elected secretary-treasurer; and H. E. Miller, director of the bureau of engineering and inspector of the state board of health, was elected chairman of the membership committee.

Those present decided upon a vigorous membership campaign, with the aim of obtaining as members as many as possible of the 100 filter plant operators and water works superintendents in the state, as well as engineers engaged in water works practice. The semi-annual meeting will be held early in December, probably in Greensboro.

Study of Subway Tunnel Ventilation

The United States Bureau of Mines, in co-operation with the New York-New Jersey Bridge and Tunnel Commission, is carrying on in a mine near Pittsburgh investigations of the conditions affecting ventilation of vehicular tunnels. T his is believed to be the first time a coal mine has been used for such purpose. An experimental tunnel has been built in the mine which is about 130 feet below the surface of the ground and more than 1,000 feet from the mouth of the mine, because of which it will be free from the wide temperature fluctuations and leakages of air which there would be in a model above ground. Observations will be made on the effect of temperature, rate of air flow, humidity, smoke and exhaust gases on the men driving the test cars through the tunnel.

Ten automobiles will be run at 40-foot intervals and at a rate of 10 miles an hour through the test tunnel. Meantime 21,000 cubic feet of air per minute, or sufficient to maintain a concentration of four parts of carbon monoxide per 10,000 parts of air by volume, will be passed through the tunnel. Each driver and observer in the tunnel will be subjected to examination before and after the tests by physicians and physiologists and the amount of carbon monoxide absorbed by each person during the tests will be determined by analyses of the blood before and after the test. Especially sensitive methods of making these blood examinations have been developed by the Bureau of Mines. Means are provided for giving the air in the test tunnel the heat and humidity likely to exist in the tunnel under the Hudson river during any weather conditions. The main object of the test is to determine the largest amount of the exhaust automobile gases, and more more especially carbon monoxide, in the air that a man can breathe without suffering any harmful effects.

Hiram F. Mills

Hiram F. Mills, who died on October 4 at Hingham, Mass., after a long illness, had for years been well known as a hydraulic engineer, but perhaps was best known by his connection with the sewage disposal and water purification experimental work of the Massachusetts State Board of Health, of which he had been the animating spirit. He was born in 1836 and graduated from the Rennsselaer Polytechnic Institute in 1856. Soon after the death of James B. Francis, perhaps the best-known hydraulic engineer of his time, Mr. Mills was called to take charge of the water power at Lowell and shortly after became chief engineer of the Locks and Canal Company of that city.

He became a member of the Massachusetts State Board of Health in 1886 and was made chairman of the committee on water supply and sewerage and it was chiefly due to his work in this position that the Lawrence experimental station was started. He was connected with the preliminary studies for the improved sewerage and drainage of the Boston metropolitan district, the damming of the Charles river, and other investigations more or less intimately connected with hydraulics and public health.

He was made an honorary member of the American Society of Civil Engineers in 1909. He contributed a number of professional papers to this society and others, dealing with the use of piezometers, water wheels, the purification of water and sewage, and other features of hydraulic engineering and public health. In 1917 Mr. Mills resigned his position at Lowell and moved to Hingham, where he spent most of his time in writing books on hydraulics, which it is hoped will be published for the value they will have for the profession.

PUBLIC WORKS

Published Weekly
by
Public Works Journal Corporation

Publication Office, Floral Park, N. Y.
Advertising and Editorial Offices at 243 W. 39th St., New York, N. Y.

Subscription Rates
United States and Possessions, Mexico and Cuba..$3.00 year
All other countries .....$4.00 year

Change of Address
Subscribers are requested to notify us promptly of change of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western office: Monadnock Block, Chicago

S. W. HUME, President J. T. MORRIS, Treasurer
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Detour Signs on State Highways

Several of the state highway departments realize the importance of detour signs and are careful to insist that such signs be placed so as to secure for those using the roads the least possible inconvenience due to the closing of roads during construction. In addition, several of them send, at intervals of a week or longer, a list of new detours for publication in local papers throughout the state. For instance, we have just received from the state of Pennsylvania a list of detours established during the past week on four highways, which are described by name and also by route number.

Some highway departments, however, seem to consider that it is none of their concern how those using the highway manage to find routes around obstructions which they make during repairing or construction of highways. For instance, an automobilist who has recently spent some time in North Carolina informed us a few days ago that he found very few detour signs in that state. On numerous occasions he had no warning of the blocking of a road by a construction gang until the work came in sight and he was directed by the foreman to return two or three miles to the nearest road by which a detour was possible. Even where a detour sign was placed at the point where automobilists should leave the blocked road, after entering the detour he found no further signs to direct him, but was left to his knowledge of the country or questioning of natives to learn how to get back to the main highway again.

It is, in our opinion, an undoubted duty of the highway department to prevent the annoying and sometimes serious delay and inconvenience caused by this failure to post detour signs. Aside from this, it would seem to be a part of wisdom on the part of the department to endeavor to obtain and maintain the good will and approval of the taxpayers of the state, inasmuch as they must be looked to for further appropriations for the maintenance of the department, and few things are more likely to irritate the users of the highways than this apparent disregard of their convenience and the repeated annoyances of experiences such as those referred to. The cost in dollars of a sufficient number of detour signs is insignificant when compared to the cost of the construction and repair work being done, and the failure to post such signs must be attributed merely to thoughtlessness or carelessness. We believe that state officials, from the highest to the lowest, should give serious consideration to this which they may have considered as a trivial matter. The inconvenience to the public of closing a road during construction is a serious matter and everything should be done to minimize the inconvenience.

How Large Construction Profits Can and Should Be Made

On the contract for the New York State Highway 8039, about 47,890 feet long, described in this issue, the contractor during the first 40 days made an average progress of 681.2 linear feet per day of a roadway 20 feet wide, thus laying 1,514 square yards or 309 cubic yards per 9-hour day. One day about a month after the construction was commenced he made a record of 950 linear feet, equal to 2,111 square yards or 431.8 cubic yards.

With a shorter haul or a little extra effort the contractor might probably before the completion of the work, have attained or surpassed 1,000 linear feet per day with the same force and equipment. This is a notable showing compared with a record of 600 linear feet or its equivalent of 272 cubic yards per day, which would generally be considered large for pavement of this width and thickness. At the average speed established during the first six weeks, the contractor would have completed the paving in about 70 days total as compared with about 80 days required for a rate of 600 feet per day.

This work has been done under ordinary conditions, with a moderate quantity of ordinary

standard equipment and a total force of only 53 men with a payroll of $450 per day. The labor cost does not, therefore, exceed that ordinarily incurred for a similar job done at a much slower rate. For the first month the progress varied from about 500 to 800 feet per day. If even this maximum had been maintained constantly throughout the remainder of the job after having first been attained, it would have afforded the contractor a profit even larger than the one that he is due to make by the excellent though smaller total average finally established.

It is manifestly impossible to get maximum results immediately after the commencement of the job; according to the daily records this contractor constructed 4,131 feet during the first 6 days and by this time had apparently nearly gotten into his stride. Assuming, therefore, that six days were necessary to perfect and adjust all of his arrangements and operations, there remained 43,758 linear feet of the road to be paved and which might conceivably have been done at the assumed maximum of 1,000 feet per day, thus requiring 44 days for its completion and costing $19,800 for labor. If it had taken the ordinary time of one day for 600 feet, this part of the road would have taken 73 days and cost $32,850 for labor. If the actual average of 681.2 feet per day had been maintained continuously after the sixth day the time required would have been 64 days and the labor cost $28,800.

Thus we have an actual direct saving of labor cost of $4,050 for an average demonstrated 40-day speed and of $13,050 for the possible average speed. Besides this saving the contractor would have saved 9 days or 29 days' time for which the fixed and overhead charges would have easily amounted to $100 per day, therefore his total actual saving over the cost of 600 feet per day would amount, at the 40-day average rate to $4,050+900=$4,950 and at an average of 1,000 feet per day to $13,050+$2,900=$15,950, an amount which is entirely reasonable and practicable.

This computation demonstrates most forcibly the tremendous importance of establishing maximum progress at the earliest possible moment and maintaining it uninterruptedly throughout the job; results which can be attained in most cases by making and executing a careful schedule of operations, by insuring the delivery of materials in advance of requirements, and by the use of proper equipment and organization. This involves little or no extra cost, produces large cash dividends by shortening the time of work and reduces overhead, and releases the plant and equipment for other profitable work.

A recent report of concrete paving issued by the California Highway Commission calls attention to a record of "Fast Progress" with an average of 170 cubic yards per day laid on a 13.6-mile road, which although evidently there considered notable, is only 62 per cent as fast as the 274.6 cubic yards per day of the total actual working time that was made on the New York State Highway 8039, and the only 39 per cent as fast as the maximum speed there recorded.

Maximum Rates of Pavement Construction

How much concrete pavement can be laid in a day by one mixer and its gang? What are the principal elements entering into the securing of maximum rates of construction?

These two questions are of the greatest importance to contractors engaged in laying concrete pavement, since the answer to the first determines the amount which it is necessary in preparing bids, to estimate for interest and depreciation on plant and other overhead charges; while by finding the true answer to the latter he can lower costs and increase profits.

From time to time during the past few years claims have been made for one contractor or another that he has established a record in the laying of concrete pavements. Referring to some of these which have been published in PUBLIC WORKS we find that the apparent record in 1917 was set by Frank L. Cohen in Westchester county, New York, when he averaged a little more than 600 feet per day of 16-foot by 6-inch pavement, this being equivalent to 1,080 square yards or 180 cubic yards per day; his maximum being 750 feet and the average gang at the mixer being 32 men. Two years later G. P. Scharl, in Branch county, Michigan, laying a pavement of similar dimensions, averaged 593 feet a day, equivalent to 1,054 square yards or 176 cubic yards—only 2 per cent or 3 per cent less than Cohen's record; reaching a maximum of 700 feet per day and 126 feet per hour. In 1920 Elder & Co. reached a maximum of 781 feet of 14-foot pavement in 9 hours, which gives a less yardage than the two just named.

Compare with these the work described in this issue where W. J. Porter in Long Island laid a 20-foot road averaging about 6¾ inches thick and reinforced at the rate of 732 lineal feet per day, equivalent to 1,627 square yards or 305 cubic yards, and attaining a maximum of 950 feet in 9 hours, with a gang of 18 men at the mixer. This rate is more than 20 per cent greater in lineal feet than either of the previous ones and about 70 per cent greater in cubic yardage, while the maximum lineal feet per day is about 30 per cent greater. Mr. Porter used no novelties in mechanical appliances or in construction methods, although he must have used machinery and methods exceedingly well adapted to the work. It would seem that his unusual record is due to excellent organization and so controlling every element entering into the construction that there was no lost motion or lost time at any point.

Probably every contractor has equaled this record for a few minutes at a time, but Mr. Porter has succeeded in continuing the record minute after minute throughout the day, minimizing the time lost by the mixer in waiting for materials, in moving ahead and in the scores of ways whereby a second might be lost here and another there until the daily rate proves to be far below that attained without special effort during perhaps 5 or 10 continuous minutes.

Averaging the number of feet run, square yards and cubic yards (since the first determines to a certain extent the number of times the mixer must be moved and the forms laid, the second deter-

mines the amount of area to be surfaced, while the third is the measure of the material brought to and handled by the mixer), this contractor has exceeded previous records, so far as we know them, by about 50 per cent and with no greater number of laborers or greater expense for machinery than is common with such work. Any contractor who has carefully figured the large part that overhead as well as labor plays in the cost of such work can appreciate what a very considerable effect this must have had upon this contractor's profits.

All of this would seem to indicate that the day of the haphazard contractor has passed and that work and profits will go to those who familiarize themselves with the best appliances suitable for conditions in question and then use them to the best advantage, eliminating all losses of time due to lack of co-ordination of the various operations and appliances entering into the work of construction.

Possibly some contractor has made even a better record than that described this week. We will be glad to learn and print the details of any other work where the rate exceeded or equaled this.

Unemployment Measures

Latest information concerning the amount of unemployment in the country and the measures being adopted for relieving the situation. Enough public work for all who are in urgent need.

Following the calling of the President's Conference on Unemployment and especially the publishing of the preliminary recommendations of that committee, cities, counties and states in all parts of the country have been taking action more or less definite with a view to reducing the unemployment. We have received advices from various parts of the country relative to this general subject and one of the encouraging features of these is to note that so many of the larger cities are reporting that, with them at least, the unemployment is rapidly diminishing or, upon investigation, is found to be less than was formerly believed. Typical of these is the statement of Mayor Snively of Duluth, that "conditions due to unemployment in Duluth may have been a little exaggerated," although "the fact cannot be discounted that there will be suffering to a considerable degree during the cold weather and that those who are in a position to render assistance should do so." At this writing (October 12th) information that has reached the conference is summed up by Secretary Hoover in the statement that not more than 10 to 20 per cent of the reported unemployment is of a kind demanding emergency measures. That is, not more than half a million to a million need immediate work to prevent suffering.

From other sources comes endorsement of the idea suggested in our editorial of last week that general and permanent solution of the unemployment problem necessitates a reduction of wages and prices of building materials. One correspondent in Pennsylvania says: "As soon as labor gets sane leaders and wants to work at right wages there will be no need of unemployment conferences," stating that farmers' produce is rotting on the ground because wages were too high to enable them to get it to market and that houses are scarce because building wages were too high, while on the other hand the builders were idle.

In general, however, the advices tell of the organization of municipal committees or of work actually being done by cities, counties and states. As typical of the smaller places, Norristown, Pa., intends to do considerable grading this fall which would otherwise have been put off until next spring. Mayor Moore of Philadelphia said that his administration was doing everything possible to put men to work and it had let more contracts in the last few months than were ever let before in a similar period. Charleston, W. Va., reports the number of unemployed reduced about one-third within the last two months.

Ohio cities seem to have been especially active. Canton has under way nearly $1,000,000 worth of paving, water works and sewer construction; Columbus is making a city-wide survey with a view to arranging for as much work as possible during the winter, this including laying sewers and water mains with a complete overturn of workers every week or two. In Marion, Ohio, Mayor Andrews is making street repairs in small units so that they will not have to be advertised and is thus keeping busy most of those who would otherwise be unemployed. In Ironton, Ohio, city improvements are taking care of most of the unemployed, which number about 30 per cent of the local labor. Akron is building upwards of 75 miles of street improvements and will lay 14 miles of water mains, bread winners of families being given preference. Mayor Scott of Newark, Ohio, has announced that that city plans to give employment to 200 or more on city improvements. In Middletown, Ohio, the Chamber of Commerce and the city government are doing their best to rush public work, on which employment will be given to permanent residents of the city.

From several sources some suggestions that the passing of an adequate road law by Congress would greatly help matters, as was suggested by us several weeks ago. In Texas, Rollin J. Windrow, state highway engineer, says that several thousand men can be employed on Texas highway work this fall and winter if the funds are available. The highway department had laid out plans with the expectation that the usual alloting of federal aid for 1921 would be forthcoming, only to learn that a 25 per cent reduction in federal aid appropriations was contemplated. Instead of a reduction, he strongly advocated doubling the federal aid appropriation to meet the present unemployment emergency. The same ideas were expressed by Thomas J. Wasser, chief engineer of the state highway commission of New Jersey.

While most of the cities and towns in the country are organizing their local forces and especially the charitable organizations and others such as the Kiwanis clubs, Rotary clubs, etc., a new idea seems to have been suggested by the Central Unemployment Committee of Philadelphia, this being to obtain the co-operation of the Post Office Department for using the letter carriers to deliver and collect cards at all households and business establishments with a view to obtaining accurate information concerning the unemployment situation and the possibility of placing the unemployed. In the same city the council directed the Department of Public Works to increase the penaltv for delaying contract work and the rigid enforcing of penalties now in force, with a view to immediately terminating the practice of some contractors of delaying the beginning or prosecution of city contracts in the hope that wages would fall.

The acting director of the Reclamation Service, Ottomar Hamerle, states that $16,000,000 could be spent economically during the winter on irrigation projects already under way, giving employment to 16,000 men directly and as many more indirectly, and that $28,000,000 more and 25,000 men could be used on other projects for which plans are complete. A loan to the reclamation fund would have to be authorized bv Congress to make this possible.

Consideration of all information available seems to indicate that work is imperative for about one per cent of the population and desired by three or four per cent; and that, even if private industries can not be induced to absorb them, work for all can be found on city, county, state and federal public work; but that, to effect this, every such political unit must plan to care for its own unemployed and take immediate steps for beginning a sufficient amount of public works, in most cases only that which it may have intended postponing until next spring or later.

Salvaging Waste in Pittsburgh

Work being done by private organizations in Pittsburg in the salvaging of waste materials and at the same time furnishing employment for those temporarily out of work is described in the September number of the "National Municipal Review" by H. Marie Dermitt, secretary of the Civic Club of Allegheny county. The author states that the largest organization that has taken up this work in Pittsburgh is the Association for the Improvement of the Poor, in addition to which the Salvation Army's industrial department, the "Good Will Industries" and the St. Vincent de Paul Society are working along somewhat the same line. The first named association established nine years ago a "Men's Industrial Department," "the main object of which is to give employment to thousands of men who are temporarily out of work and to provide work for men who are not able to do full-time work because of age, crippled condition and lack of training." The apparent success obtained offers a suggestion to other cities of one method that they may employ for relieving the present unemployment.

The "Men's Industrial Department" is now self-supporting through the collection and sale of waste material, including newspapers, magazines, old furniture, bric-a-brac, clothing, carpets, rugs, shoes, etc. A building has been erected and provided with the equipment necessary for repairing and renovating old clothes, reblocking and repairing hats, with carpet looms, wood working machinery, equipment for repairing clocks, and others. An average of 14 tons of waste paper are brought to this building every day and eight trucks are in constant use collecting this and the other waste materials. Ten thousand thrift bags are distributed in homes all over the city to be collected when filled. The contents are sterilized before sorting. This department between March, 1920, and March, 1921, received a total income of $62,000, about $41,000 of which was receipts from the sale of paper stock. In addition, a part of the building is used as a hotel where lodgings and meals for hundreds of men are provided and during the same period this had a total income of $21,514 against a total expense of $17,562. The income from paper is considerably less than it was, since the price for magazine paper stock has fallen from $60 a ton to below $20 and other kinds of paper and rags proportionately. Work is given regularly to 60 men a day on the average, who wander in from among the city's unemployed or stranded men.

The "Good Will Industries," established in 1918 by the Home Mission Board of the Methodist church, has its goodwill bags distributed among 10,000 people and collected regularly, and apparently operates in much the same way as that just described. The Salvation Army Industrial Department collects an average of 4 tons of waste daily by means of 6 wagons, and this also just about pays expenses with a little balance for the latest fiscal year.

As it costs the city $9.22 a ton for collecting rubbish and waste by yearly contract, it would appear that the taxpayers are saved this amount for each ton of waste that is collected by these organizations and that the city could afford, if necessary, to contribute this amount to the support of this work whether done by private organizations or under municipal direction.

Progress on California State Highway Paving Contract

The California highway commission, A. B. Fletcher, state highway engineer, announces that Contractor H. J. Kaiser has just completed laying the concrete pavement on a section of state highway in Tehama county from Red Bluff to the northerly boundary, after a record run.

The contract for constructing this 5-inch x 15-foot reinforced concrete base, 13.6 miles long, was awarded to Mr. Kaiser in March, construction was commenced on May 21 and finished September 16. Just 98 working days were consumed in laying the concrete base of this contract, the average progress being 733 lineal feet per day, or 3.58 miles per month. Over 16,625 cubic yards of concrete were involved in the work and an average of 170 cubic yards of concrete were laid per working day.

Recent Legal Decisions

THE QUESTION OF COMPULSORY EXTENSION OF WATER MAINS CONSIDERED

The Kentucky Court of Appeals holds, Mountain Water Co. v. May, 231 S. W. 908, that where the effect of ordering an extension of a water company's pipe line to serve a resident would be to throw the company into bankruptcy, deprive the city of fire protection and those now using the water of continuance of the service, it is error to grant a mandatory injunction compelling the extension, although the franchise contract provides that no part of the city shall be discriminated against in the use of the water system. This is not a case, the court said, where a public service commission has the power to determine when and upon what terms a water company shall extend its mains for the purpose of meeting the demands of the inhabitants of the municipality. Nor is it a case where the city itself is engaged in furnishing water to the inhabitants and therefore exercises a governmental discretion with which the courts will not interfere. On the contrary, it is a case where an independent corporation exercises a franchise under a contract providing in substance that the water works shall be for the use of the inhabitants generally, and that no street or locality shall be deprived of or discriminated against in the use thereof. Under this contract it is the duty of the water company, as new streets are opened within the limits of the city as they existed when the franchise was granted, and residences are built thereon, to extend its mains so as to furnish the occupants of such residences with water. Ordinarily, a mandamus or mandatory injunction will lie at the instance of a consumer to compel a water company to extend its mains to any part of the city where its franchise requires it to operate. Topeka v. Topeka Water Co., 58 Kan. 349, 49 Pac. 79; West Hartford v. Board of Water Comr., 68 Conn. 323, 36 Atl. 786; Bothwell v. Consumers' Co., 13 Idaho 568, 92 Pac. 533, 24 L. R. A. (U. S.) 485; Hatch v. Consumers' Co., 17 Idaho 204, 104 Pac. 670, 40 L. R. A. (U. S.) 263.

The right to such relief, however, is not absolute, and the relief may be denied where the demand is wholly unreasonable, in view of the peculiar hardships and disastrous consequences that would follow. Doubtless the mere fact that the income from the extended service would not compensate the company for the cost of the extension would furnish no cause for refusing to compel the service required by the contract, if its income were otherwise sufficient, and the rights of the public would not be injuriously affected, but the circumstances here presented did not stop there. The company's franchise would expire in two years. Its income was consumed in the operation and maintenance of the plant. It had no funds on hand with which to make the extension, and was unable to borrow the money. If compelled to make the extension, it would, as said above, be thrown into bankruptcy. The case was held to be one where the rights of the few must give way to the rights of the many.

ACQUISITION OF WATER UTILITY BY MUNICIPALITY —JURISDICTION OF COMMISSION

The Pennsylvania Public Service Commission holds that it has jurisdiction to consider the application of a municipality for the commission's approval of the municipality's acquisition of the plant of a water utility, although no application has been made in a court of law in which the value of the plant and the right and financial ability of the applicant to acquire it may be judicially determined. The decisions of the commission being subject to review by the courts, the right of the water company to be heard on these questions is thereby safeguarded. An application by the Borough of Waynesboro for a certificate of public convenience evidencing the commission's approval of the plant of the Waynesboro Water Company was therefore granted.

LOCATION OF WATER MAINS

The Washington Public Service Commission, dismissing a petition of the City of Yakima for an order requiring the Pacific Power & Light Company to replace a wooden pipe line with a permanent iron or metal pipe, or lay a pipe line outside the area to be paved, holds that the commission has no jurisdiction to order the change unless it is necessary to enable the company to render safe, adequate and efficient service at a reasonable cost to its patrons. The prevention of possible injury to the pavement which may be laid over the existing main is a matter to be settled between the city and the company without the intervention of the commission. The question of the location of mains by utilities is usually covered in the franchise granted by the municipality to the utility.

INCREASE OF FIRE HYDRANT RENTALS OVER CONTRACT RATES VALID WHERE AUTHORIZED BY STATE

The Missouri Supreme Court, City Water Co. v. City of Sedalia, 231 S. W. 942, following the rule established by the Supreme Court of the United States (see Pawhuska v. Pawhuska Oil & Gas Co., 250 U. S. 394), holds that every contract between cities of that state and a public utility is always subject to modification by the paramount power of the state, and when a change is so made it is binding upon the city; the change having been made by the state as the representative of the city. Therefore, where a city contracted with a water company for the rental of fire hydrants at a specified yearly sum, and the Public Service Commission subsequently made an order finding that these rates did not afford a reasonable return on the water company's investment, it is held that a subsequent increase, authorized by the commission, did not abrogate the contract.

NEWS OF THE SOCIETIES

Oct. 17—ILLINOIS STATE FEDERATION OF LABOR. Aurora, Ill., Headquarters, 166 W. Washington St., Chicago.

Oct. 18-20—AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION. Hotel McAlpin, New York City.

Oct. 19 — NEW YORK SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies' Building, New York City.

Oct. 19—METROPOLITAN SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineering Societies' Building, New York City. Secretary, G. I. Rhodes, 115 Broadway, New York City.

Oct. 20 — BRIDGEPORT BRANCH, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Stratfield Hotel. Secretary, Arthur R. Parker, Watrous Engineering Co., Bridgeport.

Oct. 20-21 — CITY PAVING CONFERENCE. Engineers Club of Philadelphia, 1317 Spruce St., Philadelphia. H. E. Hopkins.

Oct. 20-21—OHIO STATE CONFERENCE ON CITY PLANNING. Annual conference. Columbus, Ohio. Secretary-treasurer — Charlotte Rumbold, Chamber of Commerce Building, Cleveland.

Oct. 21 — COLUMBUS SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Southern Hotel. Secretary, Arthur Richards, County Surveyor's Office.

Oct. 24-28 — AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention. Southern Hotel, Baltimore, Md. Secretary, Charles Carroll Brown, St. Petersburg, Fla.

Oct. 25—ATLANTA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Get-together dinner. Secretary, J. T. Wikle, Fulton Bag & Cotton Mills, Atlanta.

Oct. 25—PHILADELPHIA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineers' Club. Secretary, W. H. Kavanaugh, University of Pennsylvania, Philadelphia.

Oct. 26-27—OKLAHOMA SECTION, AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting. Oklahoma City.

Oct. 31-Nov. 5 — NEW ENGLAND ASSOCIATION OF COMMERCIAL ENGINEERS. Power show in connection with INTERNATIONAL TEXTILE EXPOSITION. Mechanics' Building, Boston, Mass. Secretary, James F. Morgan, Devonshire st., Boston.

Nov. 14-16—CITY MANAGERS' ASSOCIATION. Annual meeting. Chicago. Secretary, H. G. Otis, city mgr., Clarksburg, W. Va.

Nov. 14-18 — AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting. New York City.

Nov. 16-18 — NATIONAL MUNICIPAL LEAGUE. Chicago. Secretary, H. W. Dodd, 261 Broadway, New York City.

Nov. 17—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with Society of Naval Architects and Marine Engineers. New York.

Nov. 17-18—SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS. New York.

Dec. 6-9—AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. 14th annual meeting. Baltimore, Md.

Dec., 22-23—KANSAS ENGINEERING SOCIETY. Hutchinson, Kan.

Jan. 17-20 — AMERICAN ROAD BUILDERS' ASSOCIATION. Annual Convention and good roads show. Chicago, Ill.

May 15-19 — AMERICAN WATER WORKS ASSOCIATION. Annual convention. Philadelphia, Pa.

BROOKLYN ENGINEERS' CLUB

The twenty-fifth anniversary of the founding of the Brooklyn Engineers' Club, with Andrew T. Caldwell, president; Walter M. Meserole, vice-president; Andrew J. Provost, Jr., secretary, and Kenneth Torrance, trustee, for the first officers, was celebrated by a dinner held in the banquet hall of the Brooklyn Chamber of Commerce Oct. 8, about 250 members and distinguished guests being present.

The principal speeches, introduced by past president Nelson P. Lewis, acting as toastmaster, were:

"Engineering in the Development of Commerce," by Hon. William C. Redfield, former Secretary of Commerce.

"The Public Service Corporation and the Public," J. W. Lieb, vice-president of the Edison Company.

"Brooklyn's School of Engineering," Dr. William H. Nichols, chairman of the corporation of Brooklyn Polytechnic Institute.

"Industrial Brooklyn," T. I. Jones, president of the Brooklyn Manufacturers' Industrial Exposition, Inc.

"The Brooklyn Engineers' Club," Col. Willard T. Chevalier.

"A Word from the Older Members," William T. Donnelly.

The most delightful feature of a very pleasant evening was the presentation to past president Joseph Strachn, the best loved member of the club, who for 20 years has served it devotedly as its most indefatigable secretary, of a beautifully engrossed memorial and a very substantial financial tribute expressing the appreciation and affection of individual members of the club.

The club, organized with a charter list of 50 members, has prospered steadily and its membership of more than 400 includes many of the most eminent engineers and prominent builders and manufacturers and public officials in Greater New York.

A printed record exists of papers presented and discussed during the intervening years covering a very wide range of subjects; informal talks have been given upon a still wider range of subjects, not all upon technical lines, but all of very human interest; excursions have been arranged to many engineering works of importance and to industrial plants whose operations furnish food for thought to the organizer of business.

Since the Club acquired its own house in 1909 exhibitions have been organized from time to time to bring closely to the attention of members many matters of interest which could best be shown in that way.

The first exhibition was of the Engineering books of the year 1909, followed at intervals by exhibitions of materials and methods of construction and later, as a modest scale, a showing of industrial Brooklyn, given by this Club, which has awakened an interest of borough wide extent and, without doubt, will become an annual event in Brooklyn.

Thus from a small beginning the club has grown to an established position in the community and in the spacious house to which it holds title the members gather each Thursday night from October to June and enjoy an interchange of views, absorb new thoughts, promote friendships, old and new, and in general develop a helpful and hopeful spirit.

AMERICAN SOCIETY OF CIVIL ENGINEERS

At the regular meeting of Oct. 5 papers were presented on Rainfall and Run-Off, by C. E. Grunsky.

The Flood of June, 1921, in the Arkansas River, at Pueblo, Colorado, by James Munn and J. L. Savage, and illustrated by a large number of slides showing the damage by the Pueblo flood.

An address was also made by C. Terrell Bartlett, describing the Recent Flood at San Antonio, Texas, and was illustrated with lantern slides.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Recent meetings of Local Sections have been held since the summer vacation in a number of cities including those of:

October 1—Waterbury Branch, Shepaug Outing. Visit to the proposed reservoir site of the Waterbury Water Supply Company.

October 4—Providence Section, joint meeting with Management Division. Address on Safety Appliances by Franklin D. Warren of the American Mutual Liability Insurance Company.

October 5—Buffalo Section. Address on The Construction of a Three Hundred and Sixty Million Gallon Filtration Plant by Theodore A. Leisen of the Board of Water Commissioners, City of Detroit.

October 7—Trip to Aberdeen Proving Grounds. Joint meeting with the Society of Automotive Engineers. A demonstration of the very latest developments in the Ordnance Material at Aberdeen.

NEW YORK SECTION, AMERICAN SOCIETY OF CIVIL ENGINEERS

In arranging the programme for 1921-22 the main thought has been to adhere to the principle laid down by the Section in its first year of activity—to confine itself largely to the discussion of problems touching the engineering life of the Metropolitan District. With that end in view, six of the eight meetings concern themselves with such problems.

There is, also, a continuation of last year's innovation—that of holding joint meetings with the New York Sections of the other National Engineering Societies. The Programme Committee believes that the members will favor continuance of close relationship with these Sections. Three joint meetings have been arranged, one concerned with a Metropolitan District problem (that of the Port of New York), and the others with matters of more general engineering interest.

The policy of the Section's meetings last year was to provide for sufficient speakers to fill the entire evening. This year it is proposed to have a more limited number of invited speakers, ranging from five to seven, and to allow a fair amount of time for discussion from the floor.

While the meetings are planned under the auspices of the New York Section,

all members of the American Society of Civil Engineers are cordially invited to attend.

PROGRAMME FOR 1921-1922

NOTE: The meetings are called to order promptly at 7:45 P. M. All meetings are held in the Engineering Societies' Building, 33 West 39th Street, New York City.

October 19th, 1921—Joint meeting with New York Sections of A. S. M. E., A. I. M. M. E. and A. I. E. E. Subject, Financing Public Utilities and Large Engineering Projects. Opening address by A. B. Leach, of A. B. Leach & Co., bankers.

November 14th, 1921—Joint meeting with New York Sections of A. S. M. E., A. I. M. M. E. and A. I. E. E. Subject, The St. Lawrence Ship Channel and Power Project. This will be presented by Hon. Henry J. Allen, Governor of Kansas, and will probably be discussed by Hon. Nathan L. Miller, Governor of New York.

December 21st, 1921—The Zoning Law—What It has Done for New York. Opening address by Edward M. Bassett, counsel of the Zoning Committee and chairman of the commission which framed the zoning law.

January 11th, 1922—Traffic Handling—Its Engineering as Well as Regulatory Aspects. Opening addresses by E. P. Goodrich, consulting engineer, and Amos Schaeffer, consulting engineer to the Borough President of Manhattan.

February 15th, 1922—Removal of Solid Wastes. Opening address by John P. Leo, Commissioner of Street Cleaning, New York City.

March 15th, 1922—Joint meeting with New York Sections of A. S. M. E., A. I. M. M. E. and A. I. E. E. Subject, Port of New York. Opening address by E. H. Outerbridge, chairman of the Port of New York Authority.

April 19th, 1922—It is hoped that on this date a discussion may be had on the Hudson River Bridge, but due to certain contingencies in connection with the work of the corporation promoting the project, the meeting cannot be assured until early in the new year. Announcement will be made later.

May 17th, 1922—Need of Regional Planning for the New York District. Opening address by Charles D. Norton, first chairman of the Plan of Chicago.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

At the recent meeting at White Sulphur Springs, W. Va., the executive board of the A. G. C. made several changes affecting the organization of the association. These revisions provide among other features for membership through local chapters, state or construction area divisions to be known as 'branches," a new schedule of dues favoring the contractor doing an annual business of less than $500,000, and an increase of the board of directors from 12 to 19 and election by territory. Moreover, the board recommended that the committee on organization consider a plan creating a junior membership with limited privileges, which should include superintendents and general contractors not now eligible for membership in the A. G. C.

BRIDGE ERECTION LECTURE

At the Brooklyn Institute of Arts and Sciences, October 6th, Frank W. Skinner, Associate Editor of PUBLIC WORKS, and consulting engineer, delivered a popular lecture on the Erection of Long and Lofty Steel and Concrete Bridge Spans, illustrated by 100 stereoptican views, selected from his course of university lectures on Civil Engineering Construction Operations.

The lecture briefly reviewed the development of a bridge building, which since the construction of a crude arch discovered in a Theban tomb, more than 4,000 years old has passed through the stone, wood, wrought iron, cast iron, steel, supersteel concrete and combination types. It made little progress through 40 centuries up to 150 years ago when cast iron was first used for arch spans in England. Another long step was taken a few years later when wrought iron became available and in the past 30 years, since the use of steel has increased the maximum length and capacity of spans has increased many fold from a previous extreme length of 550 feet to 1800 feet already constructed, and 3,250 feet now designed and urged for a double deck, 10-track railroad and highway suspension bridge across the North River, New York.

The design of bridges has been largely influenced in this country by the economics of erection, and the methods adopted have gradually been developed into a number of principal types which were illustrated by progress views of most of the classical bridges of the world, including those across the East River, New York, the Niagara, St. Lawrence, Ohio, Mississippi and Missouri Rivers in this country and describing different methods and difficult operations illustrated by the Poughkeepsie, Manhattan, Hell Gate, Quebec, Victoria and many other great cantilever arch and suspension bridges in America, besides the famous Fourth Bridge, Gokteik and Uganda viaducts and other notable constructions abroad.

The non-technical descriptions included many anecdotes of heroism, ingenuities, and human interest. The lecture is one of a course at the Institute, that includes the subaqueous tunnels of New York and the aqueducts of New York, San Francisco, and Winnipeg.

INTERNATIONAL ASSOCIATION OF MUNCIPAL ELECTRICIANS

The twenty-sixth annual convention of the International Association of Municipal Electricians was held at Colorado Springs on September 6th to 9th. The attendance was good and a great deal of constructive work was accomplished, and many interesting papers delivered. The officers elected for the ensuing year are: President, W. R. Arbuckle; vice-presidents, first, Dr. Charles P. Steinmetz; second, J. L. Caldwell; third, D. R. Snyder; fourth, John Southwell; secretary, Clarence R. George; treasurer, William Crane; and executive committee, E. H. Benz, chairman, R. C. Turner, C. E. Convers, William G. Dey, C. K. Ahearn, F. K. Shinnen, George L. Smith, Dave Reed and H. L. Strong.

WASHINGTON STATE GOOD ROADS ASSOCIATION

The twenty-second annual convention of the Washington State Good Roads Association was held in Tacoma September 15th and 16th. The attendance was large, and those present were addressed by numerous well-known speakers on all phases of road work, including highway construction, highway beautification, road legislation, road signs, etc.

NATIONAL DRAINAGE CONGRESS

The National Drainage Congress held its tenth annual meeting in St. Paul, Minn., on September 22-24th. The most important feature of this meeting was the passing of resolutions urging more adequate state protection of settlers on reclaimed lands and the improvement and simplification of state laws affecting drainage and other forms of reclamation.

NATIONAL DRAINAGE CONGRESS

The three-day session of the National Drainage Congress was held in St. Paul commencing Sept. 22 with an attendance of more than 100 prominent engineers from different parts of the country. Percival B. Coffin urged drainage commissioners to solicit competent engineering advice to develop broad and comprehensive plans for the drainage of their districts. He said that the drained land should be laid out, planted with trees, provided with highways, and furnished with stores at convenient centers for the promotion of agricultural, business and social activities. He added that the construction engineer had never had any opportunity like that of the present for developing America's vast empire of unused land.

F. H. Newell, consulting engineer of the United States Reclamation Service, stated that thousands of acres of reclaimed land are lying idle in spite of enormous expenditures made by the government for the irrigation and drainage work because there is no proper system of colonization. These tracts have now mostly fallen into the hands of large owners who will not sell them at prices suitable for colonization. Attention should be given to the best results attained in Wisconsin and Canada where many settlers have been attracted to reclaimed lands through the interest the government takes in them.

PERSONALS

Johnson, John E., of Paducah, Ky., has been appointed highway engineer for the western district of the state highway department of Kentucky, to succeed Hugh Crozier who has been appointed assistant engineer in the headquarters office at Frankfort.

Grant, Major U. S., 3rd, Corps of Engineers, U. S. Army, has been appointed a member of the California Debris Commission.

Robinson, Capt. John K., has been promoted to be chief of the Bureau of Engineering of the U. S. Navy.

Mayes, J. B., formerly with the South Carolina state highway department, has been appointed road engineer of Williamsburg county, S. C.

Vanneman, Charles R., has been appointed chief engineer of the New York state public service commission to be in charge of the engineering and inspection work of all steam railroads, street railways, grade crossings, electric light companies and telephone and telegraph companies.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

NEW TYPE OF AIR COMPRESSOR

The Ingersoll-Rand Co. announces a new type of belt-driven air compressor known as the "Imperial X C B" in which it has incorporated several noteworthy features, including Ingersoll-Rand plate valves for both air intake and discharge, and the 5-step clearance control for regulating the compressor's output.

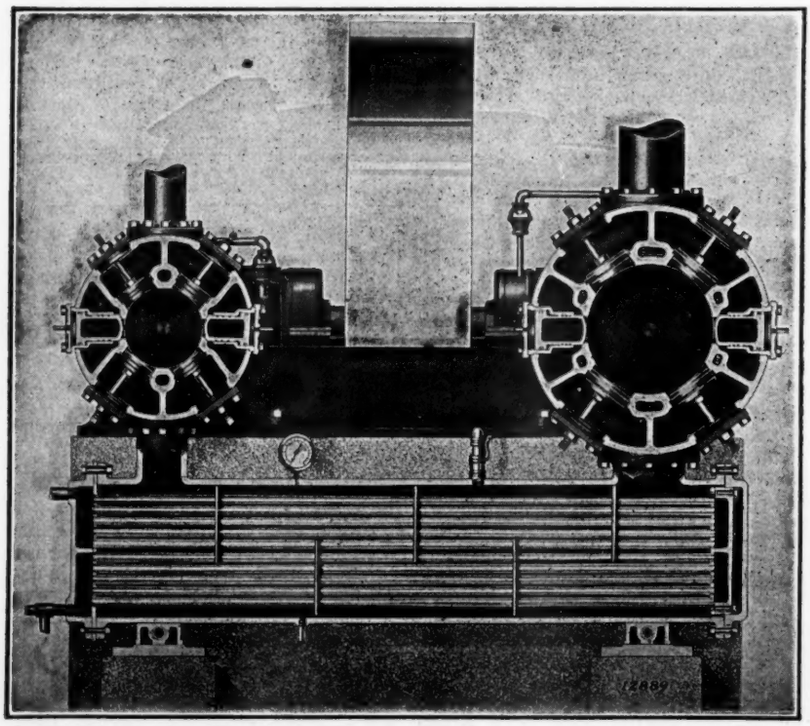
The plate valves include the features which have been proven necessary to the successful functioning of the lightweight type of valve, notably that the valve be supported throughout its entire operation in perfect alignment without any form of wearing guide, which is essential to the life of the valve.

The clearance control has been used by the same company on direct-connected compressors where it has been found most satisfactory and efficient and the use of this form of regulation is considered a most noteworthy development in air compressor design. It is a method of securing extremely efficient operation at partial loads, the compressor being automatically loaded or unloaded in five successive steps, which steps are obtained by the reduction or addition of clearance space to the air cylinders. The compressor will operate at full, ¾, ½, ¼ or no load and the design of the clearance control is such as to secure efficient operation at any one step, the reduction in output power required being practically in proportion to the reduction in output capacity, the entire control being automatic.

With this method of control there is no loss of power due to wastage of air and leakage. The clearance pockets in the cylinder are automatically thrown into communication with the ends of each cylinder in proper succession, the process being controlled by a predetermined variation in receiver pressure. With the compressor operated at partial capacity, a portion of the air is compressed into an added clearance space instead of passing through the discharge valves. On the return stroke this air expands, giving up its stored energy to the pistons. The inlet valves remain closed until the cylinder pressure equals the intake pressure. At this point the inlet valves are opened automatically and free air is taken into the cylinder for the remainder of the return stroke. Thus the inlet capacity is reduced without reducing the intake pressure. On a two-stage compressor, clearance space in proper proportion is added simultaneously for both high and low cylinders, giving a constant ratio of compression and maintaining conditions necessary for the highest compression efficiency throughout the entire load range.

Another feature of this control is a maximum demand stop, which will prevent the compressor being operated at any higher maximum load than is desired.

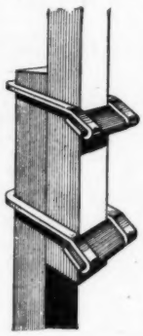
This new type of compressor can be furnished single-stage for low pressures and the two-stage for higher discharge pressure. The piston displacement capacity for 100 pounds discharge pressure ranges from 610 to 1,505 cubic feet of free air per minute. This compressor can also be furnished with a short belt drive attachment with floating idler, which secures a saving in floor space and length of belt and permits a greater arc of belt contact.



IMPERIAL X C B AIR COMPRESSOR WITH INGERSOLL-RAND INTAKE AND DISCHARGE PLATE VALVES

SCHENK TIMBER CLAMPS

The Schenk Timber Clamp consists of a U-shaped spring steel yoke with the extremities hooked to engage a transverse lockplate. The two pieces of timber to be connected are placed parallel to each other with the overlapping ends in contact and enclosed by a pair of yokes with the lockplate adjusted at an angle to the yoke. The plate is then reyoke, thus powerfully until it is parallel and in contact with the yoke, thus powerfully tightening the latter on the timbers so that it acts as an eccentric increasing the frictional pressure between the timbers with any farther displacements and holding them securely together.



This device is strong, simple and cheap and can be rapidly attached and detached by a turn of the wrench without danger of injuring the wood. When Schenk clamps are used the timbers need not be cut to any required length, do not require bolts, nails, pins or any other connection, will not slip under heavy load, can be quickly set to the exact required height, can be assembled and removed more quickly than by any other method, are strongest at the point of connection and are not injured by making or removing the connection. Clamps are carried in stock for 3x4, 2x6, 3x4 and 4x4-inch sizes of timber.

The Blaw-Knox Company announces the addition to its staff of H. O. Davidson, who will have entire charge of the Prudential Sectional Building Department of the Blaw-Knox Company and will be also general manager of the C. D. Pruden plant of the Blaw-Knox Company. Mr. Davidson, who will be located at the C. D. Pruden plant at Baltimore, was connected for eight years with the Hydraulic Steelcraft Company, being general manager of that organization at the time he severed his connections to become a member of the Blaw-Knox staff.